

## RADON IN TENNESSEE



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### What is radon?

Radon, the second leading cause of lung cancer, is a colorless, odorless, tasteless and invisible radioactive gas that is formed by the decay of the naturally occurring, radioactive element, uranium, in the soils and rocks of the earth. When uranium decays, it forms radium, which decays further to form radon gas. Radon is known as ***the Silent Killer***.

### How does it get into my home?

Since radon is a naturally occurring gas, it is everywhere. When there is not a building trapping the natural upward flow of radon, it disperses through air and causes little harm.

However, buildings block this upward flow of radon and build pressure. This allows the radon to seep into them. It moves into homes through cracks in walls, floors and vents, around slab penetrations, floor/wall junctures, block walls, sump pumps, well water supplies, and other openings. All homes and structures are susceptible to radon. It is a myth that only basements or newer homes and buildings are at risk. The type of construction, design, use, and/or age of the structure does not determine radon levels.

### Want more information?

<http://epa.gov/iaq/radon/pubs/citguide.html#howdoes>

### What are the health effects of radon?

There are no immediate symptoms of exposure to radon gas. It is a silent killer.

Radon is the second leading cause of lung cancer in the United States, second only to cigarette smoking. **Radon does not cause headaches, shortness of breath, coughing, or fever.**

Inhalation of radon gas causes mutations in healthy lung cells and causes cancer with prolonged exposure. Smokers are at a higher risk of developing lung cancer from exposure to radon since smoking exacerbates the mutation of lung cells and deteriorates lung function.

#### **SURGEON GENERAL HEALTH ADVISORY**

“Indoor radon gas is a national health problem. Radon causes thousands of deaths each year. Millions of homes have elevated radon levels. Homes should be tested for radon. When elevated levels are confirmed, the problem should be corrected.”

### What is the important new information on health effects of radon?

The health risk posed by residential radon exposure may have been substantially underestimated in previous studies, according to investigators at the University of Iowa College of Public Health. Their findings indicate that the exposure assessment models used in many previous studies may have underestimated the risk posed by residential radon exposure by fifty percent or more. Because of the magnitude of lung cancer incidence and its poor survival rate, even secondary causes of lung cancer such as prolonged residential radon exposure are important, researchers stated.

The Environmental Protection Agency has published “[A Citizen’s Guide to Radon: The Guide to Protecting Yourself and Your Family From Radon \(third edition\)](#).” It is a complete guide for citizens to learn more about radon

#### **Want more information?**

<http://www.epa.gov/iaq/radon/pubs/citguide.html#risk>

### Radon, the silent killer in Tennessee

Radon first gained national attention in the early eighties. Shortly thereafter, Tennessee became involved in radon issues at the state level. In a statistically valid survey of homes, some startling facts emerged.

#### Percent of single family homes likely to have radon levels above EPA recommended limit of 4 pCi/l based upon 1987 survey

National	Tennessee
6%	16%

Today, it is known that portions of Tennessee have an even higher incidence rate for elevated radon levels than first found. Some of these areas of higher radon concentrations include Nashville-Davidson County, Williamson and Rutherford Counties, the Central Middle Tennessee area, Knoxville-Knox County, and the Tri-Cities area of East Tennessee as well as karst areas scattered throughout the state. In many of these areas, the percent of single-family homes with elevated levels of radon have ranged from **thirty percent (30%) to fifty percent (50%)**.

### Where is radon found in Tennessee?

It is found everywhere. However, there are areas where it is more likely to be found. The following table summarizes areas where radon is found and the type of soils or rocks in which it occurs.

Area	Description of area
Coastal plain and Mississippi Alluvial Plain of western Tennessee	High soil moisture, high water tables and lack of permeable soils. Some areas with very sandy or excessively-drained soils may cause homes to have indoor radon levels exceeding 4 pCi/l.
Highland Rim and Nashville Basin of middle Tennessee	Area is underlain by sedimentary rocks, principally limestone, shale, chert and dolostone. Areas underlain by cherty limestone have high radon potential. Limestone and shale part of the Highland Rim has moderate radon potential. Nashville Basin has high geologic radon potential. Presence of abundant phosphatic soils, local karst and presence of generally well-drained soils contribute to the potential for high radon levels. Very high to extreme indoor radon levels are possible where homes are sited on soils developed on the Chattanooga shale, on phosphate-rich residual soils or on karst pinnacles
Appalachian Plateau of east Tennessee	Sandstones and shales underlie most of this area. There are areas of sandy, well-drained to excessively-drained soils and some karst areas may be a source of locally elevated radon levels.
Ridge and valley	Limestone, shale, chert, dolostone and sandstone underlie most of

of upper east Tennessee	this region that also has areas of karst and well-drained soils. Sandstone and cherty dolostone form most of the ridges. Limestone and shale form most of the valleys. Very high to extreme indoor radon levels are found in homes that are sited on soils containing black shales, phosphate-rich residual soils or karst pinnacles.
Unaka Mountains of upper east Tennessee	Area is underlain by siltstone, sandstone, conglomerate, quartzite, phyllite, gneiss, granite and metamorphosed volcanic rocks. Homes on phosphate-rich residual soils developed on phosphatic carbonate rocks are among those that may be high.

### What does the EPA mean by saying I'm in zone...?

The Environmental Protection Agency (EPA) has classified areas of the United States with potential radon problems based upon five factors:

- Indoor air data
- Geology
- Aerial radioactivity
- Soils
- Foundation

There are three groups in the classification and they are based upon the factors identified above and range from high to lower.

- Zone One, high risk factor for radon
- Zone Two, moderate risk factor for radon
- Zone Three, low risk factor for radon

EPA recommends that all homes be tested for radon regardless of zone designation or geographic location. There is no zone that has no risk factor for radon.

## How do I know what zone my county is in?

### Tennessee counties with radon by zone

#### Zone 1

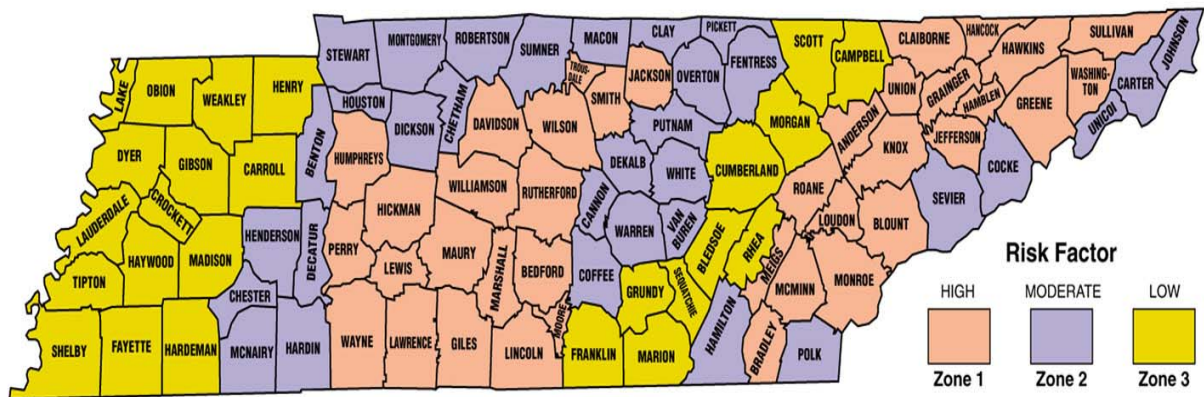
Anderson, Bedford, Blount, Bradley, Claiborne, Davidson, Giles, Grainger, Greene, Hamblen, Hancock, Hawkins, Hickman, Humphreys, Jackson, Jefferson Knox, Lawrence, Lewis, Lincoln, Loudon, Marion, Marshall, Maury, McMinn, Meigs, Monroe, Moore, Perry, Roane, Rutherford, Smith, Sullivan, Trousdale, Union, Washington, Wayne, Williamson, Wilson

#### Zone 2

Benton, Cannon, Carter, Cheatham, Chester, Clay, Cocke, Coffee, Decatur, DeKalb, Dickson, Fentress, Johnson, Hamilton, Hardin, Henderson, Houston, Macon, McNairy, Montgomery, Overton, Polk, Pickett, Putnam, Robertson, Sevier, Stewart, Sumner, Unicoi, Van Buren, Warren, White

#### Zone 3

Bledsoe, Campbell, Carroll, Crockett, Cumberland, Dyer, Fayette, Franklin, Gibson, Grundy, Hardeman, Haywood, Henry, Lake, Lauderdale, Madison, Marion, Morgan, Obion, Rhea, Scott, Sequatchie, Shelby, Tipton, Weakley



### What types of test results have been obtained in Tennessee?

Homeowners have reported radon levels in their homes in Tennessee as high as 3,060 pCi/L. As of 2001, 22,157 home radon tests have been made.

Percent of tests below 4 pCi/l	66%
Percent of tests between 4 and 10 pCi/l	23%
Percent of tests between 10 and 20 pCi/l	8%
Percent of tests between 20 and 50 pCi/l	2.5%
Percent of tests between 50 and 100 pCi/l	0.4%
Percent of tests over 100 pCi/l	0.1%

### What is karst topography in Tennessee

Karst topography is the name given to an area underlain by rocks such as limestone and is characterized by caves, sinkholes, and depressions. Much of Tennessee is underlain by limestone and other such rocks. Some types of rocks have higher than average uranium contents. These include light-colored volcanic rocks, granites, dark shales, sedimentary rocks that contain phosphate, and metamorphic rocks derived from these rocks. These rocks and their soils may contain as much as 100 parts per million of uranium. For an explanation of the geology of radon, visit the [USGS website](#).